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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/542,122
Filing Date: July 12, 2005
Appellant(s): ROUET ET AL.

Michael J. Marcin
<u>For Appellant</u>

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12/7/09 appealing from the Office action mailed 7/21/09.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

NEW GROUND(S) OF REJECTION

Claim 17 is rejected under 35 U.S.C. 101.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

Flórez-Valencia et al. 3D Graphical Models for Vascular-Stent Pose Simulation. ICCVG. 2002. pp. 1-8.

Dumoulin et al. Mechanical Behaviour Modelling of Balloon-Expandable Stents. Journal of Biomechanics. 2000. pp. 1461-1470.

Hernández-Hoyos et al. Computer-Assisted Analysis of Three-Dimensional MR Angiograms. Radiographics. Volume 22. 2002. pp. 421-436.

Montagnat et al. A Hybrid Framework for Surface Registration and Deformable Models. Proceedings of the 1997 Conference on Computer Vision and Pattern Recognition. 1997. pp. 1041-1046.

Yim et al. Vessel Surface Reconstruction With a Tubular Deformable Model. IEEE Transactions on Medical Imaging. Volume 20. December 2001. pp. 1411-1421.

Williams et al. Rational Discrete Generalized Cylinders and their Application to Shape Recovery in Medical Images. Proceedings of the 1997 Conference on Computer Vision and Pattern Recognition. 1997. pp. 387-392.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 17 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Said claim discloses "a computer readable

medium" (line 1) but both said claim and the respective specification (p. 1, ll. 11-16; p. 5, ll. 4-5; p. 14, ll. 22-23) fail to disclose whether said "computer readable medium" is limited to a non-transitory tangible medium or transitory propagating signal. Reading said claim under the broadest reasonable interpretation "computer readable medium," specially "computer readable medium for storing a computer program executable...," is considered to read on a transitory propagating signal. See the Subject Matter Eligibility of Computer Readable Media memo dated February, 23 2010 (1351 OG 212). A claim directed to only signals per se is not a process, machine, manufacture, or composition of matter and therefore is not directed to statutory subject matter. See MPEP § 2106. Thus, both said claim and said specification fail to define said "computer readable medium" to be statutory media.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 6,10, 11, 13 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Flórez-Valencia et al. (3D Graphical Models for Vascular-Stent Pose Simulation) in view of Dumoulin et al. (Mechanical Behaviour Modelling of Balloon-Expandable Stents) in view of Hernández-Hoyos et al. (Computer-assisted Analysis of Three-Dimensional MR Angiograms) in view of Montagnat et al. (A Hybrid Framework

for Surface Registration and Deformable Models) and further in view of Yim et al. (Vessel Surface Reconstruction With a Tubular Deformable Model).

In regard to claim 1 Flórez-Valencia et al. teach: creating a deformable tubular mesh model (e.g., cylindrical stent mesh model; "...The stent model is also a cylindrical mesh..." – § 1, ¶ 3) for fitting a 3D path (e.g., $A_p(l_p)$ – parametric 3D curve representing the centerline of a stent; § 2, ¶ 1) based on a centerline (e.g., $A_v(l_v)$ – parametric 3D curve representing the centerline of a vessel; § 2, ¶ 1) of a 3D tubular object (e.g., vessel) of interest (§ 2, ¶s 2-3; Fig. 2), the 3D path comprising a set of ordered points (e.g., vertices) defining a plurality of path segments ("...The discretized version of each centerline $A(l)$ is a set of vertices $\{a_i\}$..." – § 2, ¶ 1; "The surface is bound to the centerline: each surface vertex v_j is associated with the 3 closest centerline vertices $\{a_{i-1}, a_i, a_{i+1}\}$..." – § 3.2, ¶ 2; Fig. 5). It is noted that a portion of a centerline located between two respective centerline vertices is considered to read on a segment of a centerline (e.g., Fig. 5 is considered to illustrate at least two centerline segments).

<u>It is noted that the respective claim language fails to disclose what exactly constitutes an "initial radius" and thus a radius of said initial straight model of said stent is considered to read on an "initial radius."</u> Flórez-Valencia et al. teach the mesh model having an initial radius ("Fitting the stent to the vessel axial shape can then be seen as a process of sliding the predefined shape $C_p(l_p)$ along the centerline $A_v(l_v)$ ... mapping the axis $A_p(l_p)$ of the initial straight model of the stent onto the vessel centerline..." – § 2, ¶ 2).

Flórez-Valencia et al. teach: the mesh model comprising a plurality of mesh segments corresponding to the plurality of path segments ("...Let $A_p(l_p)$ and $A_v(l_v)$ be parametric 3D curves representing the centerlines of the stent and of the vessel respectively ... The discretized version of each centerline $A(l)$ is a set of vertices $\{a_i\}$..." – § 2, ¶ 1); automatically adapting a length of a mesh radius of each mesh segment based on the corresponding path segment and the initial radius ("...Maracas accurately extracts centerline points $\{a_i\}$ and roughly estimates a set of radii $\{r_i\}$. This provides an initialization of the simplex-mesh model close to the vessel boundary and, together with the axial constraint, can be successfully used for 3D segmentation of the vessel..." – § 3.3, ¶ 1; "...The stent model is placed between l_{v0} and an end point at l_{vM}, with l_{v0} a user-defined delivery point and l_{vM} an end point automatically deduced (for a given radius) from the length/radius relation that characterizes the stent-expansion process [5]." – § 2, ¶ 2).

It is noted that method taught by Flórez-Valencia et al. is reliant upon teachings disclosed in papers [5: Dumoulin et al. – pp. 1463-1465, § 3.1], [7: Hernández-Hoyos et al. – p. 425, col. 1, ¶ 3; p. 425, col. 2, ¶ 3; pp. 427, 428, § How Does it Work; p. 434, § Conclusions; Figs. 7-9], [8: Montagnat et al. – pp. 1043, 1044, § 3.1; pp. 1044-1046, § 5] and [16: Yim et al. – p. 1414, col. 1, ¶s 2-3; p. 1414, col. 1, ¶ 3; p. 1415, col. 1, ¶ 1; p. 1416, col. 1, ¶ 3; p. 1417, col. 1, ¶ 2; p. 1419, col. 2, ¶ 3; Fig. 4] which are directly referenced by Flórez-Valencia et al. (p. 2, ¶s 2, 3, 4; p. 3, ¶ 5). It is noted that the respective claim language fails to disclose what exactly constitutes "a product of," for example, an element A and an element B. It is further noted that the respective claim

language fails to disclose what exactly constitutes a "shrinking factor." Yim et al. teach automatically adapting a length of a mesh radius of each mesh segment based on a product of (e.g., consideration of) an initial radius and a shrinking factor (e.g., warping/truncation amount), the shrinking factor determined based on a radius of local curvature of the corresponding path segment (e.g., radius prior to warping/truncation; "A second feature of the tubular coordinate system, as mentioned in the previous section, is that the radii do not emanate in straight lines from the axis at all points. Rather, the radial lines are warped in areas where the vessel axis is curved. This warping prevents radial lines from adjacent axial locations from intersecting one another." – p. 1414, col. 1, ¶ 2; "The radial lines are defined prior to the deformation process…" – p. 1414, col. 1, ¶ 3; "Condition for truncation of radial lines. Radial lines project outwards perpendicularly from the predefined axis of the tubular coordinate system. In certain cases the radial lines must be truncated to prevent intersections…" – p. 1414, Fig. 4; "The truncation point for each radial line is then defined as the point at which the radial line leaves its own territory…" – p. 1415, col. 1, ¶ 1; p. 1417, col. 1, ¶ 2; Fig. 4).

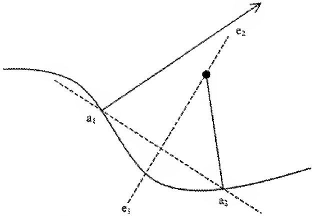

Fig. 4. Condition for truncation of radial lines. Radial lines project outwards perpendicularly from the predefined axis of the tubular coordinate system. In certain cases the radial lines must be truncated to prevent intersections. The condition for truncation is that a radial line leaves its "territory". In this diagram, the radial line from the axial position a_3 is truncated when it enters the territory of a_1. The boundary between two territories is located at the line of equidistance between a_1 and a_2 (e_1e_2). Truncation of radial lines from nonadjacent axial positions (11) is shown.

It would have been obvious to one skilled in the art, at the time of the Applicant's invention, to incorporate the respective teachings of said papers (e.g., [5], [7], [8] and [16]) into the method taught by Flórez-Valencia et al., because Flórez-Valencia et al. explicitly state the use of said teachings to implement the method taught by Flórez-Valencia et al. and thus through such incorporation it would provide a means of rendering said method operable.

In regard to claim 2 Flórez-Valencia et al. teach creating a tubular structure for fitting the 3D path ("...The stent model is also a cylindrical mesh..." – § 1, ¶ 3) and mapping the tubular structure onto a 3D surface of the tubular object of interest (mapping the axis $A_p(l_p)$ of the initial straight model of the stent onto the vessel centerline..." – § 2, ¶ 2; § 3.4, ¶ 1). However, Flórez-Valencia et al. fails to explicitly teach wherein the object of interest is represented in a gray level 3D image. It is implicitly taught by Flórez-Valencia et al. that color, at least to some degree, is utilized

because both a given object of interest and a mesh are made visually apparent and are not invisible (Figs. 3, 4).

At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to color the object of interest in gray because Applicant has not disclosed that coloring the object of interest in gray provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with either the color used by Flórez-Valencia et al. or the claimed gray coloring because both colors perform the same function of visually identifying for a given user a given region for further processing. Therefore, it would have been an obvious matter of design choice to modify Flórez-Valencia et al. to obtain the invention as specified in claim 2.

In regard to claim 3 Flórez-Valencia et al. teach computing the 3D path that corresponds to the centerline of the tubular object of interest and defining the path segments on the 3D path ("...Let $A_p(l_p)$ and $A_v(l_v)$ be parametric 3D curves representing the centerlines of the stent and of the vessel respectively ... The discretized version of each centerline $A(l)$ is a set of vertices $\{a_i\}$..." – § 2, ¶ 1; "The surface is bound to the centerline: each surface vertex v_j is associated with the 3 closest centerline vertices $\{a_{i-1}, a_i, a_{i+1}\}$..." – § 3.2, ¶ 2; Fig. 5). It is noted that a portion of a centerline located between two respective centerline vertices is considered to read on a segment of a centerline (e.g., Fig. 5 is considered to illustrate at least two centerline segments).

Flórez-Valencia et al. teach: creating an initial straight deformable cylindrical mesh model, of any kind of mesh, having a length along a longitudinal axis equal to a length of the 3D path (e.g., a length of said stent; "The initial model of the stent is constructed by placing predefined-shape contours $C_p(l_p)$, circular or polygonal, equally spaced along a straight axis…" – § 2, ¶ 2; Fig. 3); dividing the initial mesh model into segments of length corresponding to the path segments of the 3D path ("…Let $A_p(l_p)$ and $A_v(l_v)$ be parametric 3D curves representing the centerlines of the stent and of the vessel respectively … The discretized version of each centerline $A(l)$ is a set of vertices {ai}…" – § 2, ¶ 1; Figs. 3, 4); computing, for each mesh segment of the initial mesh model, a rigid-body transformation ("…one expects cylindrical structures with a high bending capability but for which deformations should preserve the generalized cylinder shape…" – § 3.2, ¶ 1) that transforms an initial direction of the mesh segment into a direction of the corresponding path segment of the 3D path, and applying the transformation to corresponding vertices of the mesh segment (§ 2, ¶ 2; § 3.2; § 3.4, ¶ 1; Figs. 3, 4).

In regard to claim 6 the rationale and motivation disclosed in the rejection of claim 1 is incorporated herein, specifically: Yim et al. – p. 1414, col. 1, ¶ 2; p. 1417, col. 1, ¶ 2; Fig. 4.

In regard to claim 10 it is noted that said claim invokes 35 U.S.C. 112 sixth paragraph. The rationale disclosed in the rejection of claim 1 is incorporated herein. Flórez-Valencia et al. teach a means for acquiring 3D medical image data of said 3D object of interest ("…The vascular lumen 3D image is first acquired using contrast-

enhanced magnetic resonance angiography (MRA) technique [4]…" – § 1, ¶ 4). It is implicitly taught that said method, including said acquisition means, is implemented via a computer system, wherein said system includes a processor (e.g., circuit means) for executing respective computer instructions to perform said method as said method is directed toward the processing of 3D graphical models from 3D image data acquired via contrast-enhanced magnetic resonance angiography.

In regard to claim 11 Flórez-Valencia et al. teach "…The stent model is also a cylindrical mesh. Merging both meshes simulates artery stenting…" (§ 1; Fig. 1). It is noted that an artery is considered to read on an organ. The rationale disclosed in the rejection of claim 10 is incorporated herein.

In regard to claim 13 Flórez-Valencia et al. teach wherein the deformable tubular model is created with 2-simplex meshes ("…In 2-simplex meshes used to represent surfaces, each vertex has exactly three neighbors. 2-simplex meshes are topologically dual to triangulations, thus making conversions back and forth easy..." – § 3).

In regard to claim 17 the rationale disclosed in the rejection of claim 10 is incorporated herein. It is implicitly taught that said system comprises a computer readable medium for storing said instructions as said method would be unable to be executed without instructions controlling said processor and for said instruction to exist they must be stored in some form of memory.

Claims 4, 5, 7-9, 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Flórez-Valencia et al. (3D Graphical Models for Vascular-Stent Pose Simulation), Dumoulin et al. (Mechanical Behaviour Modelling of Balloon-Expandable

Stents), Hernández-Hoyos et al. (Computer-assisted Analysis of Three-Dimensional MR Angiograms), Montagnat et al. (A Hybrid Framework for Surface Registration and Deformable Models) and Yim et al. (Vessel Surface Reconstruction With a Tubular Deformable Model), as applied to claims 1-3, 6,10, 11, 13 and 17, in view of Williams et al. (Rational Discrete Generalized Cylinders and their Application to Shape Recovery in Medical Images).

In regard to claim 4 Flórez-Valencia et al. fail to teach blending (e.g., linearly interpolating) the rigid-body transformations of consecutive mesh segments. Williams et al. teach the use of interpolation between two consecutive segments (e.g., cross sections) in a rational discrete generalized cylinder (pp. 389, 390, § 4; p. 390, § 5.1, p. 391, § 6; Fig. 4). It would have been obvious to one skilled in the art, at the time of the Applicant's invention, to incorporate the teachings of Williams et al. into the method taught by Flórez-Valencia et al., because such incorporation would provide a means of minimizing distortion (e.g., twist) of said cylinder thus resulting in a more continuous model.

In regard to claim 5 Flórez-Valencia et al. fail to teach wherein a linear interpolation is used between rotations of consecutive mesh segments (e.g., family of rotations) for blending the 3D rigid body transformation to limit self-intersection between bent (e.g., twisted) portions of the deformable tubular mesh model. Williams et al. teach wherein a linear interpolation is used between a family of rotations to limit self-intersection between twisted portions of the deformable tubular mesh model (pp. 390,

391, § 5.2; p. 391, § 6; Fig. 4). The rationale and motivation disclosed in the rejection of claim 4 is incorporated herein.

In regard to claim 7 Flórez-Valencia et al. implicitly teach wherein said method involves approximation, specifically approximation of local curvature, as said method is directed towards a simulation and a simulation is not considered able to flawlessly mirror reality (e.g., a simulation, no matter how good, can only account for so much). However, Flórez-Valencia et al. fail to teach applying a radius modulation technique via linear blending (e.g., linear interpolation) from one radius (e.g., segment) to another. Williams et al. teach the use of interpolation between two consecutive segments (e.g., cross sections) in a rational discrete generalized cylinder (pp. 389, 390, § 4; p. 390, § 5.1, p. 391, § 6; Fig. 4). It is noted that each section of said cylinder defined by a respective radius is considered to read on a segment. The motivation disclosed in the rejection of claim 4 is incorporated herein.

In regard to claim 8 Flórez-Valencia et al. teach that "...one expects cylindrical structures with a high bending capability but for which deformations should preserve the generalized cylinder shape..." (§ 3.2, ¶ 1). However, Flórez-Valencia et al. fail to explicitly teach computing a minimal 3D rotation from an initial mesh direction to a target segment. Williams et al. teach computing the minimal 3D rotation from the initial mesh direction to a target segment (pp. 389-390, § 4; p. 390, § 5.1, 5.2, p. 391, § 6; Fig. 4). It is noted that computing the minimal 3D rotation from an initial mesh direction to a target segment is considered to read on minimizing mesh torsion. The motivation disclosed in the rejection of claim 4 is incorporated herein.

In regard to claim 9 Flórez-Valencia et al. fail to explicitly teach: defining rotations between segments using an axis parameter and a rotation angle parameter; computing the parameters iteratively between adjacent segments so that a new rotation for a current segment comprises a composition of a found rotation for a previous segment and the minimal rotation from the previous segment to the current segment. The rationale and motivation disclosed in the rejection of claim 8 is incorporated herein, specifically: Williams et al. – pp. 389, 390, § 4; p. 390, § 5.1, 5.2, p. 391, § 6; Fig. 4. It is noted that the iterative processing of a family of rotations, as disclosed by Williams et al., implicitly teach that a rotation performed after a previous rotation in said family of rotations will be, at least to some degree, dependent upon the previous rotation.

In regard to claim 14 the rationale disclosed in the rejections of claims 1 and 3-5 are incorporated herein.

In regard to claim 15 the rationale disclosed in the rejection of claim 7 is incorporated herein.

In regard to claim 16 the rationale disclosed in the rejection of claim 6 is incorporated herein. It is noted that a diameter for said model is consider equal to two times the respective radius and that a change in the radius is considered to result in a change, at least to some degree, in the diameter.

(10) Response to Argument

In response to applicant's remarks that Yim et al. fail to disclose or teach that the mesh radius is adapted "based on a product of the initial radius and a shrinking factor" or that that "the shrinking favor is determined based on the initial radius and a radius of

local curvature of the corresponding path segment" it is noted that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

It is noted that the respective claim language fails to disclose what exactly constitutes an "initial radius" and thus a radius of said initial straight model of said stent is considered to read on an "initial radius." Flórez-Valencia et al. teach the mesh model having an initial radius ("Fitting the stent to the vessel axial shape can then be seen as a process of sliding the predefined shape $C_p(l_p)$ along the centerline $A_v(l_v)$ ... mapping the axis $A_p(l_p)$ of the initial straight model of the stent onto the vessel centerline…" – § 2, ¶ 2). Flórez-Valencia et al. teach automatically adapting a length of a mesh radius of each mesh segment based on the corresponding path segment and the initial radius ("…Maracas accurately extracts centerline points $\{a_i\}$ and roughly estimates a set of radii $\{r_i\}$. This provides an initialization of the simplex-mesh model close to the vessel boundary and, together with the axial constraint, can be successfully used for 3D segmentation of the vessel…" – § 3.3, ¶ 1; "…The stent model is placed between l_{v0} and an end point at l_{vM}, with l_{v0} a user-defined delivery point and l_{vM} an end point automatically deduced (for a given radius) from the length/radius relation that characterizes the stent-expansion process [5]." – § 2, ¶ 2). It is noted that the respective claim language fails to disclose what exactly constitutes "a product of," for example, an element A and an element B. It is further noted that the respective claim language fails to disclose what exactly constitutes a "shrinking factor." Yim et al. teach

automatically adapting a length of a mesh radius of each mesh segment based on <u>a product of (e.g., consideration of)</u> an initial radius and a <u>shrinking factor (e.g., warping/truncation amount)</u>, the shrinking factor determined based on a radius of local curvature of the corresponding path segment (e.g., radius prior to warping/truncation; "A second feature of the tubular coordinate system, as mentioned in the previous section, is that the radii do not emanate in straight lines from the axis at all points. Rather, the radial lines are warped in areas where the vessel axis is curved. This warping prevents radial lines from adjacent axial locations from intersecting one another." – p. 1414, col. 1, ¶ 2; "The radial lines are defined prior to the deformation process…" – p. 1414, col. 1, ¶ 3; "Condition for truncation of radial lines. Radial lines project outwards perpendicularly from the predefined axis of the tubular coordinate system. In certain cases the radial lines must be truncated to prevent intersections…" – p. 1414, Fig. 4; "The truncation point for each radial line is then defined as the point at which the radial line leaves its own territory…" – p. 1415, col. 1, ¶ 1; p. 1417, col. 1, ¶ 2; Fig. 4).

In response to applicant's remarks that the examiner seeks to cure the deficiencies of Yim et al. by referring back to Flórez-Valencia et al. the examiner does not agree. It is noted that Flórez-Valencia et al., not Yim et al., serves as the base reference. Furthermore, <u>it is noted that the method taught by Flórez-Valencia et al. is reliant upon teachings disclosed in papers [5: Dumoulin et al. – pp. 1463-1465, § 3.1], [7: Hernández-Hoyos et al. – p. 425, col. 1, ¶ 3; p. 425, col. 2, ¶ 3; pp. 427, 428, § How Does it Work; p. 434, § Conclusions; Figs. 7-9], [8: Montagnat et al. – pp. 1043, 1044, § 3.1; pp. 1044-1046, § 5] and [16: Yim et al. – p. 1414, col. 1, ¶s 2-3; p. 1414, col. 1, ¶ 3;</u>

p. 1415, col. 1, ¶ 1; p. 1416, col. 1, ¶ 3; p. 1417, col. 1, ¶ 2; p. 1419, col. 2, ¶ 3; Fig. 4] which are directly referenced by Flórez-Valencia et al. (p. 2, ¶s 2, 3, 4; p. 3, ¶ 5) and not the other way around.

In response to applicant's remarks that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the curvature of a path segment clearly relates to the natural orientation of the tubular mesh) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In response to applicant's remarks that the bending discussed by Flórez-Valencia et al. is bending due to an external force it is noted that is all stents, be it within a body or external to a body, are subject, at least to some degree, to external forces at all times.

In response to applicant's remarks that Flórez-Valencia et al. does not adapt a length of a mesh radius based on a product of the initial radius and a shrinking factor, but rather on an external force acting upon the surface of the vessel the examiner does not agree. As previously disclosed above in the first response to applicant's remarks:

It is noted that the respective claim language fails to disclose what exactly constitutes an "initial radius" and thus a radius of said initial straight model of said stent is considered to read on an initial radius. Flórez-Valencia et al. teach the mesh model having an initial radius ("Fitting the stent to the vessel axial shape can then be seen as a process of sliding the predefined shape $C_p(l_p)$ along the centerline $A_v(l_v)$ … mapping

the axis $A_p(l_p)$ of the initial straight model of the stent onto the vessel centerline…" – § 2, ¶ 2). Flórez-Valencia et al. teach automatically adapting a length of a mesh radius of each mesh segment based on the corresponding path segment and the initial radius ("…Maracas accurately extracts centerline points $\{a_i\}$ and roughly estimates a set of radii $\{r_i\}$. This provides an initialization of the simplex-mesh model close to the vessel boundary and, together with the axial constraint, can be successfully used for 3D segmentation of the vessel…" – § 3.3, ¶ 1; "…The stent model is placed between l_{v0} and an end point at l_{vM}, with l_{v0} a user-defined delivery point and l_{vM} an end point automatically deduced (for a given radius) from the length/radius relation that characterizes the stent-expansion process [5]." – § 2, ¶ 2). It is noted that the respective claim language fails to disclose what exactly constitutes "a product of," for example, an element A and an element B. It is further noted that the respective claim language fails to disclose what exactly constitutes a "shrinking factor." Yim et al. teach automatically adapting a length of a mesh radius of each mesh segment based on a product of (e.g., consideration of) an initial radius and a shrinking factor (e.g., warping/truncation amount), the shrinking factor determined based on a radius of local curvature of the corresponding path segment (e.g., radius prior to warping/truncation; "A second feature of the tubular coordinate system, as mentioned in the previous section, is that the radii do not emanate in straight lines from the axis at all points. Rather, the radial lines are warped in areas where the vessel axis is curved. This warping prevents radial lines from adjacent axial locations from intersecting one another." – p. 1414, col. 1, ¶ 2; "The radial lines are defined prior to the deformation process…" – p. 1414, col. 1,

¶ 3; “Condition for truncation of radial lines. Radial lines project outwards perpendicularly from the predefined axis of the tubular coordinate system. In certain cases the radial lines must be truncated to prevent intersections…” – p. 1414, Fig. 4; “The truncation point for each radial line is then defined as the point at which the radial line leaves its own territory…” – p. 1415, col. 1, ¶ 1; p. 1417, col. 1, ¶ 2; Fig. 4).

It is noted that the applicant fails to argue that Flórez-Valencia et al. are limited to performing only one means of adaptation. The examiner agrees that Flórez-Valencia et al. fail to teach being limited to only one means of adaptation. However, assuming arguendo that Flórez-Valencia et al. teach adapting a length of said mesh radius only based on an external force acting upon the surface of the vessel it is the position of the examiner that said force would result in the manipulation (e.g., deformation) of respective radii of said vessel, which prior to said manipulation would have been in a different state (e.g., initial state), and that said external force resulting in the manipulation of said radii would constitute a manipulation factor of said radii (e.g., "shrinking factor” in the case where said vessel is bent in such a way that said vessel bends upon itself in which case it would not be desirable for said radii to intersect; see Yim et al.).

In response to applicant's remarks that the references fail to show certain features of applicant’s invention, it is noted that the features upon which applicant relies (i.e., “product of” means the result of multiplying, “a shrinking factor” is a defined constant) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims.

See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). While the examiner acknowledges that the term "product of," as claimed, is capable of reading on mathematical multiplication it is noted that is but one definition. For example, one could argue that successful navigation of a maze by a person is the product of chance and the ability to move. Such a result does not inherently require multiplication but it does require, at least in said example, the use of chance and movement in tandem as without both success would not be possible. Furthermore, <u>it is noted that that the respective claim language fails to explicitly limit "product of," as claimed, to only mathematical multiplication.</u> It is noted that the examiner has interpreted "product of" to read on "consideration of" and it is the position of the examiner that said interpretation is equally valid in light of the respective claim language.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

This examiner's answer contains a new ground of rejection set forth in section **(9)** above. Accordingly, appellant must within **TWO MONTHS** from the date of this answer exercise one of the following two options to avoid *sua sponte* **dismissal of the appeal** as to the claims subject to the new ground of rejection:

(1) **Reopen prosecution.** Request that prosecution be reopened before the primary examiner by filing a reply under 37 CFR 1.111 with or without amendment, affidavit or other evidence. Any amendment, affidavit or other evidence must be

relevant to the new grounds of rejection. A request that complies with 37 CFR 41.39(b)(1) will be entered and considered. Any request that prosecution be reopened will be treated as a request to withdraw the appeal.

(2) **Maintain appeal.** Request that the appeal be maintained by filing a reply brief as set forth in 37 CFR 41.41. Such a reply brief must address each new ground of rejection as set forth in 37 CFR 41.37(c)(1)(vii) and should be in compliance with the other requirements of 37 CFR 41.37(c). If a reply brief filed pursuant to 37 CFR 41.39(b)(2) is accompanied by any amendment, affidavit or other evidence, it shall be treated as a request that prosecution be reopened before the primary examiner under 37 CFR 41.39(b)(1).

Extensions of time under 37 CFR 1.136(a) are not applicable to the TWO MONTH time period set forth above. See 37 CFR 1.136(b) for extensions of time to reply for patent applications and 37 CFR 1.550(c) for extensions of time to reply for ex parte reexamination proceedings.

Respectfully submitted,

/Peter-Anthony Pappas/

Primary Examiner, Art Unit 2628

A Technology Center Director or designee must personally approve the new ground(s) of rejection set forth in section (9) above by signing below:

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Conferees:

/Ulka Chauhan/

Supervisory Patent Examiner, Art Unit 2628

/Kee M Tung/

Supervisory Patent Examiner, Art Unit 2628

/JOHN L. LEGUYADER/

Director, Technology Center 2600